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10/553,030	06/15/2006	Armin Gerhard Aberle	SFCE 302	6758

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EXAMINER	
TRINH, THANH TRUC	
ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/553,030	ABERLE ET AL.	
	Examiner	Art Unit	
	THANH-TRUC TRINH	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 July 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

As amended, claim 1 recites the limitation "coating the glass surface with a solid material film" in line 3. There is no support found for the limitation in the originally filed disclosure. Similarly, the limitation "stimulating a chemical reaction between the glass and the material film resulting in the formation of reaction products at an interface between the glass and the material film such that an interfacial surface of unreacted glass at the interface is textured" in lines 4-7 lacks of support in the originally filed disclosure. That is, there is no where in Applicant's specification discussing about a "chemical reaction" between the glass and the material film, or reasonably conveying one skilled in the art that there is a "chemical reaction" between the glass and the material film. It is noted that a "chemical reaction" is a process in which one or more substances are changed into others by arrangement of atoms of the substances to yield substances of different composition and properties. Applicant has no indication of such

changes in the specification to indicate that there is a "chemical reaction" between the glass and the material film.

Claims 2-20 are rejected on the same ground as claim 1.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-2, 4-7, 11 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Marumoto et al. (JP 08-67535, see machine translation)

Regarding claims 1, 2, 5-7, 11 and 19, as seen in Figure 1, Marumoto et al. discloses a method of texturing a glass surface and glass surface formed by the method. The method comprises the steps of:

- coating the glass surface (see SiO_2 glass substrate 1 in Figure 1, paragraphs 0008-0009) with a solid material film (see layer 2 of Ni-5% aluminum in abstract, paragraphs 009 and 0016. It is noted that metals such as nickel, aluminum, or molybdenum are solid), wherein the glass surface initially flat (see glass substrate 1 in step 1 of Figure 1). SiO_2 glass is quartz glass.
- stimulating a reaction at the interface between the glass and the material film resulting in the formation of reaction products at the interface (e.g. by

way of thermal treatment or thermal annealing as layer 2 is formed by thermal spray, or coating followed by sintering, see paragraphs 0002, 0009, 0014). Marumoto et al. describes the particles from thermal spraying form fusion or a compound between the metal and the substrate face and bit (or corrode) the substrate surface (see paragraph 0002). Furthermore, Marumoto et al. applies the same steps for texturing a glass substrate as described by Applicant, i.e. coating the glass substrate with metal layer and heating the glass substrate and the metal layer to form textured glass (as described as thermal spraying and sintering after coating, see paragraph 0014). Therefore, it is the Examiner's position that the method of Marumoto et al. comprising stimulating a chemical reaction between the glass and the material film resulting in the formation of reaction products at an interface between the glass and the material film such that an interfacial surface of unreacted glass at the interface is textured.

- removing the material film (e.g. layer 2) and the reaction products from the glass surface. (See step 3 of Figure 1, and paragraph 0010).

Regarding claim 4, Marumoto et al. teaches thermally spraying aluminum layer 2 under specific condition as seen in table 1. Therefore, the thermal annealing process is inherently conducted in a controlled ambient atmosphere.

5. Claims 1, 12-18 and 20- 21 is rejected under 35 U.S.C. 102(b) as being anticipated by Shi et al. (WO 00/28602, submitted in IDS by Applicant)

Regarding claims 1 and 9-10, as seen in Figures 1-9, Shi et al. discloses a method of texturing a glass surface comprising the steps of:

- coating the glass surface (see glass substrate 11 in Figure 1, paragraphs 0008-0009) of a solid material film (see deposition of a etching paste containing $BaSO_4$ covering the surface of the glass, page 5). It is the Examiner's position that a paste is a solid material since it is not liquid or gas.
- stimulating a reaction at the interface between the glass and the material film resulting in the formation of reaction products at the interface (e.g. by way of the $BaSO_4$ covering the surface of the glass to a significant depth to be etched by HF, see 2nd paragraph of page 5) As the material film is the etchant compound for etching the glass substrate, a chemical reaction between the glass and the material film must occur to result in the formation of the reaction products at the interface between the glass and the material film such that an interfacial surface of unreacted glass at the interface is textured; and
- removing the material film and the reaction products from the glass surface(see page 5, Figures 1-9 as Shi et al. describes washing away the etchant)

Regarding claims 12-13, 17-18 and 20, as seen in Figures 1-9, Shi et al. teaches a method of manufacturing a photovoltaic device comprising the steps of

- texturing a glass surface (see textured surface 12 of glass substrate 11 utilizing a method in claim 1 above.
- depositing a semiconductor film of amorphous or crystalline silicon (see silicon layer 15 in figures 1-9, see abstract and page 2 lines 28-30,) on the textured glass surface (e.g. 12), wherein the glass-facing surface of the semiconductor film exhibits substantially the same degree of texture as the glass surface (see Figures 1-9). The semiconductor film is deposited in a manner such that substantially no gaps or voids exist between the textured glass surface and the semiconductor film. (as Shi et al. depicts no gaps or void between the textured glass surface 12 and the semiconductor film in Figures 1-9)

Regarding claims 14-16, Shi et al. discloses a method of making a photovoltaic device as described in claim 12 above. Shi et al. further discloses forming a dielectric barrier layer of silicon nitride (see barrier 31) between the glass (11) and the semiconductor (15) prior to the deposition of the semiconductor film (see the last paragraph of page 4).

Regarding claim 21, as seen in Figures 1-9, Shi et al. teaches photovoltaic device comprising:

- a glass pane (see glass substrate 11 in Figures 1-9, abstract) having a textured surface (see texture surface 12 in Figures 1-9, abstract); and
- a semiconductor film (see silicon film 15 in Figures 1-9, abstract) formed on the textured surface of the glass pane.

Shi et al. teaches all the structural limitations of the claims; therefore the reference is deemed to be anticipatory. The limitation "a semiconductor film having an internal absorption efficiency greater than about 0.5 for photons in a wavelength range from about 600 to 1200 nm" is an inherent property of Shi et al's photovoltaic device, particularly in view of the fact that Shi et al. using the same material (e.g. silicon) applied onto a textured glass surface as Applicant. Recitation "a semiconductor film having an internal absorption efficiency greater than about 0.5 for photons in a wavelength range from about 600 to 1200 nm" is directed to specific properties of the silicon semiconductor film, it is noted that once a semiconductor film is disclosed to be silicon, and therefore is substantially the same as the semiconductor film of claim 21, it will, inherently, display recited properties. See MPEP 2112.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 3 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marumoto et al. (JP 08-67535, see machine translation) as applied to claims 1-2, 4-7, 11 and 19 above, in view of Oboodi et al. (US Patent 4794048).

Regarding claims 3 and 8, Marumoto et al. discloses a method of texturing a glass surface as set forth above, wherein the material film of metal is formed on the glass surface by spin coating, doctor blade or screen printing and followed by sintering treatment.

Marumoto et al. does not specifically teach the thermal annealing process comprising a sequence of annealing steps at different temperatures (claim 3), or the reaction product comprising aluminum oxide and/or silicon (claim 8).

Oboodi et al. teaches bonding a metal film (e.g. 18) onto a glass surface (e.g. 16) by screen printing and followed by sintering (e.g. corresponding to instant thermal annealing process), wherein the sintering step (or thermal annealing process) comprises a sequence of annealing steps at different temperatures (See Figure 3, col. 7 lines 14-36, col. 5 lines 25-27, col. 14 line 40 through col. 15 line 30, col. 8 line 36 through col. 14 line 39). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Marumoto et al. by thermally annealing the glass and the material film of metal with a sequence of annealing steps at different temperature as taught by Oboodi et al, because Oboodi et al. teaches the thermal annealing process can be carried out in a single step or in multiple steps, wherein the multiple steps are preferred (See col. 13 lines 28-30), so that the binder and solvent in the suspension (e.g. used in the printing process, see col. 11 lines 48-64) can be removed. (see col. 14 line 40 through col. 15 line 30; col. 8 line 36 through col. 14 line 39). While the reaction product of aluminum bonding to SiO_2 glass substrate comprising aluminum oxide and/or silicon is not explicitly disclosed, it would have been inherent to the method of modified Marumoto et al. as evidenced by Applicant's specification (see Applicant's specification, pages 2 and 4).

10. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marumoto et al. (JP 08-67535, see machine translation) as applied to claims 1-2, 4-7, 11 and 19 above, in view of Yamada et al. (US Patent 3876479)

Regarding claims 9-10, Marumoto et al. discloses a method of texturing substrate as set forth above. Marumoto et al. does not disclose removing the material (e.g. metal comprising aluminum) and the reaction products by one or more etching steps of a chemical etch.

Yamada et al. discloses a method of texturing a substrate by forming a aluminum foil onto the substrate followed by heat and pressure, and removing the aluminum foil by chemical etching (see abstract, col. 2 lines 18-31) to obtain extremely excellent result in roughening (or texturing) a substrate for firm adhesion (see col. 2 lines 18-31).
It would have been obvious to one skilled in the art at the time the invention was made to modify the method of Marumoto et al. by using chemical etching step to remove the aluminum layer as taught by Yamada et al., because Yamada et al. teaches such removing step would result in a extremely excellent roughened surface suitable for attaining firm adhesion. Furthermore, Ssuch modification would involve nothing more than use of known method for its intended use (e.g. removing aluminum or metal layer) in a known environment to accomplish entirely expected result (e.g. roughening or texturing a substrate).

11. Claims 12-18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marumoto et al. (JP 08-67535, see machine translation) as applied to claims 1-2, 4-7, 11 and 19 above, in view of Shi et al. (WO 00/28602)

Regarding claims 12-13, 17-18 and 20, as seen in claim 1 above, Marumoto et al. teaches a method comprising steps of:

- texturing a glass surface (see textured surface 12 of glass substrate 11 utilizing a method in claim 1 above.

Marumoto et al. does not specifically teach depositing a semiconductor film on the textured glass surface to form a photovoltaic device as claimed.

Shi et al. teaches:

- depositing a semiconductor film of amorphous or crystalline silicon (see silicon layer 15 in figures 1-9, see abstract and page 2 lines 28-30,) on the textured glass surface (e.g. 12), wherein the glass-facing surface of the semiconductor film exhibits substantially the same degree of texture as the glass surface (see Figures 1-9). The semiconductor film is deposited in a manner such that substantially no gaps or voids exist between the textured glass surface and the semiconductor film. (as Shi et al. depicts no gaps or void between the textured glass surface 12 and the semiconductor film in Figures 1-9)

It would have been obvious to one skilled in the art at the time the invention was made to modify the method of Marumoto et al. by depositing a semiconductor film on the textured glass surface as taught by Shi et al., because Shi et al. teaches such

modification would produce a photovoltaic device using textured glass substrate for light trapping to obtain higher efficiency in the cell (see lines 6-14 of page 1, and page 2)

Regarding claims 14-16, modified Marumoto et al. discloses a method of manufacturing a photovoltaic device as described in claim 12 above, wherein Shi et al. further discloses forming a dielectric barrier layer of silicon nitride (see barrier 31) between the glass (11) and the semiconductor (15) prior to the deposition of the semiconductor film (see the last paragraph of page 4).

Response to Arguments

12. Applicant's arguments filed 7/2/2010 have been fully considered but they are not persuasive.

Applicant argues that Marumoto et al. does not discloses the limitation of "stimulating a chemical reaction at the interface between the glass and the material film resulting in the formation of reaction products at the interface" because Marumoto et al. fails to disclose the formation of any reaction product at the interface. However, the Examiner respectfully disagrees. First of all, Applicant has no support regarding "a chemical reaction" at the interface between the glass and the material film resulting in the formation of reaction products at the interface. Secondly, Marumoto et al. describes the particles from thermal spraying form fusion or a compound between the metal and the substrate face and bit (or corrode) the substrate surface (see paragraph 0002). Thirdly, Marumoto et al. applies the same steps for texturing a glass substrate as described by Applicant, i.e. coating the glass substrate with metal layer and heating the

glass substrate and the metal layer to form textured glass (as described as thermal spraying and sintering after coating, see paragraph 0014). As set forth above, it is the Examiner's position that the method of Marumoto et al. comprises stimulating a chemical reaction between the glass and the material film resulting in the formation of reaction products at an interface between the glass and the material film such that an interfacial surface of unreacted glass at the interface is textured.

Applicant also argues that Shi et al. does not disclose the limitation "stimulating a chemical reaction between a glass and the material film resulting in the formation of reaction products at an interface between the glass and the material film such that an interfacial surface of un-reacted glass at the interface is textured" because Shi et al. merely discloses a physical masking process via a deposition of barium sulfate/crystals. However, Applicant's argument is not deemed to be persuasive. The material film of Shi et al. is an etchant compound containing barium sulfate, by having the etching compound contacting the surface of the glass a chemical reaction between the glass and the etchant compound is inherently stimulated.

Applicant further argues that the property of "an internal absorption efficiency greater than about 0.5 for photons in a wavelength range from about 600 to 1200" is not inherent in the device disclosed by Shi et al. because the relevancy is as recited in claim 21 a photovoltaic device that include both a glass pane having a textured surface and a semiconductor film formed on the textured surface of the glass pane. However, Shi et al. discloses exactly such structural limitations in such arrangement, therefore the

limitation "an internal absorption efficiency greater than about 0.5 for photons in a wavelength range from about 600 to 1200 nm" is an inherent property of the device.

Conclusion

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to THANH-TRUC TRINH whose telephone number is (571)272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Basia Ridley can be reached on 571-272-1453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TT
8/14/2010

/Basia Ridley/
Supervisory Patent Examiner, Art Unit 1795